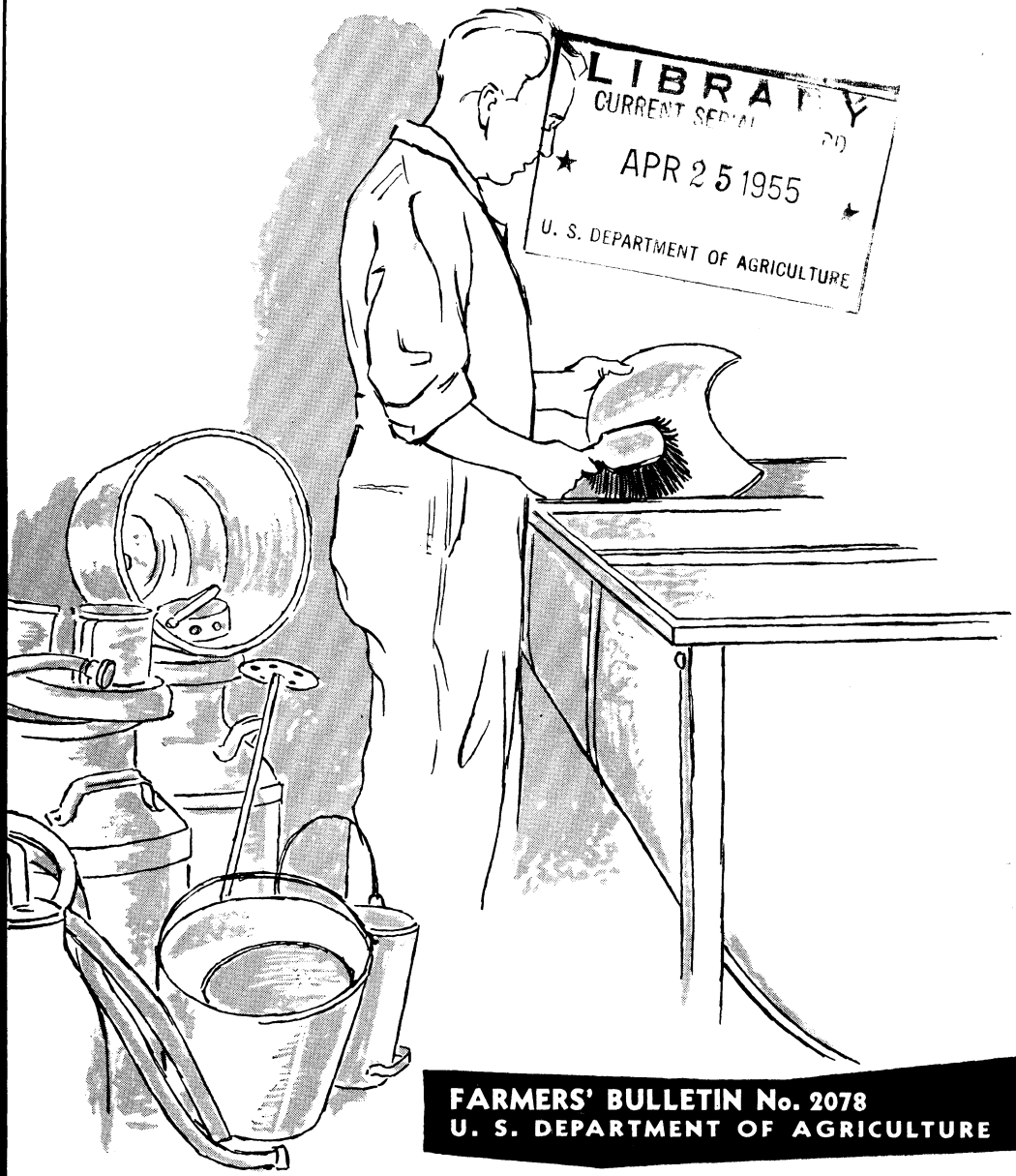


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# Cleaning and Sanitizing FARM MILK UTENSILS



**FARMERS' BULLETIN No. 2078**  
**U. S. DEPARTMENT OF AGRICULTURE**

Follow these five steps in cleaning and sanitizing milk utensils and equipment:

1. **Rinse.** Immediately after use, rinse all utensils and equipment with cold or lukewarm water.

2. **Wash.** After rinsing scrub all utensils and equipment thoroughly with a suitable brush, using hot water and an efficient dairy cleaner.

3. **Rinse.** Follow the washing operation with a hot-water rinse. The hotter the water, the better.

4. **Sanitize.** Treat the clean utensils and equipment with an acceptable sanitizing agent to kill the bacteria.

5. **Store.** Between milkings, store the clean utensils and equipment where they are protected from dirt, dust, or other contamination.

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# CLEANING AND SANITIZING



## FARM MILK UTENSILS<sup>1</sup>

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State and local governments establish sanitary standards for the production of milk in order to safeguard the public health. Every dairy farmer should be thoroughly familiar with the official sanitary requirements of the market for which he produces milk. His compliance with these requirements will prevent legal troubles and result in a greater monetary return in addition to insuring the production of high-quality milk.

High-quality milk is milk that (1) has been drawn from healthy cows into clean sanitary utensils by clean healthy milkers, (2) has been protected from contamination by dirt at all times, (3) has a low bacteria count with no pathogenic organisms present, and (4) has a fresh pleasant taste and a mild sweet odor.

The processor cannot supply high-quality milk and dairy products to the consumer unless he receives high-quality milk from the producer.

High bacteria counts and unpleasant flavors and odors in milk

often can be traced to the use of dirty utensils and equipment in handling milk on the farm. The bacteria that cause souring, off flavors, and sometimes sickness, grow and multiply very rapidly on the moist surfaces of unclean or improperly sanitized utensils, such as pails, cans, and strainers. Although the utensils may appear to be well washed, they are not really clean unless they have been treated to kill bacteria, and the usual sanitizing treatment will not be effective unless all of the milk and dirt first have been washed from the utensils.

### Equipment for Washing Milk Utensils

Washing and sanitizing milk utensils is easier and quicker with the right kind of equipment. However, proper use of the equipment is more important than the kind. On small farms where there are few utensils to wash, more simple and less expensive equipment will be needed than on larger farms, but in general the needs are much the same.

Preferably, the milkhouse should

<sup>1</sup> This publication supersedes Farmers' Bulletin 1675, Care of Milk Utensils on the Farm.

have a separate room in which to wash the utensils, and this room should adjoin the room in which the milk is handled. If the milk-house has only two rooms, it is better to wash the utensils in the room in which the boiler or stove is located than in the room in which the milk is handled. The floor of the washroom should be watertight and should slope toward a drain equipped with a trap.

A galvanized-iron round-bottom sink is a decided help in washing utensils. Such a sink may be bought from a dairy-supply house. If the utensils are sanitized with steam, the sink should have two compartments, one for washing and one for rinsing. If they are sanitized with chemicals, the sink should have a third compartment for the chemical solution.

A storage rack for clean utensils, preferably of rust-resistant pipe or angle iron, should be provided in a clean, well screened location. The utensils should be stored open end down so water can drain from them and so dirt and dust cannot fall into them.

Hot water is a necessity, and some method must be provided for supplying it. If steam from a boiler is available, a mixing valve may be used to make hot water by mixing steam with cold water. If this method is used, one outlet pipe from the valve should extend well down into the sink so the steam can be used to reheat the water in the sink. If steam is not available, some other method for supplying hot water must be provided.

Water heaters to suit practically any situation are on the market. Some connect with a pressure-type water system and furnish a continuous supply of hot water. Others, usually holding 5 to 20 gallons, have to be filled whenever hot water is needed. Both types are made to heat the water with solid fuel (such as coal or wood), oil, gas, or electricity. When pur-

chasing a heater, select one large enough to supply an abundance of hot water not only for present needs but also for an increased load as the dairy grows in size.

Every washroom should be provided with a variety of good brushes. Time will be saved, and a better job of cleaning will be done, if the proper brush for the job is at hand. Rags should not be used, because they are difficult to free of bacteria and they have a tendency to smear grease and other foreign matter instead of loosening it as a brush does.

## **The Water Supply**

A clean, safe water supply is absolutely necessary for washing and rinsing milk utensils. Contaminated water may be a source of danger to health. Bacteria multiply more rapidly in milk than in water. Therefore, milk utensils that are washed or rinsed in contaminated water may contaminate the milk and bacteria may grow in the milk to such an extent that the raw milk will make those who drink it ill even though the water would not.

Wells and springs should always be protected from surface drainage. The drainage from privies, hogpens, barnyards, and other sources of contamination always should be away from the well, and both springs and wells should be walled in, curbed, and kept covered tightly.

## **Dairy Cleaners**

Several factors should be considered in buying a dairy cleaner. It must be readily and completely soluble in water and noncorrosive to dairy metals. If the available water is hard, the cleaner should soften it. To do a thorough job, the cleaner must penetrate and wet the dirt, emulsify the fat, and loosen and disperse in the wash water all of the material adhering to the

utensils. It must rinse from the utensils easily. Lastly, it must be economical to use.

Ordinarily an alkaline cleaner or a synthetic detergent is used for day-to-day cleaning, and an acid cleaner is used to remove milkstone. Soap should not be used on milk utensils. Either milk or hard water may form calcium deposits or alkali-resisting films on the utensils which the regular cleaner will not remove. Every week or so it may be necessary to use an acid cleaner following the regular cleaner, to prevent the formation of milkstone or to remove any deposits or films that may have formed.

## **How to Wash Milk Utensils**

Immediately after use, rinse all milk utensils thoroughly with cold or lukewarm water. Never use hot water for this preliminary rinsing, as hot water will coagulate some of the milk solids and make them difficult to remove from the utensils. The sooner you rinse the utensils after use, the easier and more effective the rinsing will be.

Rinsing removes any milk residue that has not drained from the utensils and prevents it from hardening on the utensils by drying or by the action of the hot wash water. Rinsing also makes washing easier and more effective, saves cleaning agent, and reduces the rate at which the wash water becomes polluted.

If the utensils are exceptionally dirty or if the milk has dried on them, it will be worth while to use a brush with the rinse water to be sure that all the dirt and milk residue is removed. Rinse the utensils until the rinse water shows no sign of milk or cloudiness. While rinsing the utensils, wash all loose dirt from the outside.

As soon as practicable after rinsing, wash the utensils in hot water containing a good dairy cleaner. The wash water should be as hot

as the hands can bear comfortably, usually between 115° and 120° F. Hot water is needed to do a good job of removing all the dirt, especially the fat.

Put the recommended amount of cleaner in the hot wash water, place the utensils in the water, and scrub each one vigorously with a good brush. The dairy cleaner is no substitute for a good brush and plenty of "elbow grease."

Scrub all surfaces, but pay especial attention to the crevices, joints, and dented or rough spots. Dirt and milk naturally collect in such places and make an ideal spot for bacteria to lodge and grow.

Areas that often are neglected are the inside surface of the shoulders of milk cans and milking-machine pails and the inside of the covers of small-top (hooded) milk pails. Scrub these areas thoroughly and examine them carefully at each washing. Can lids and necks must be just as clean as the rest of the can, for they come in contact with the milk and, if dirty, may contaminate the whole can of milk.

Do not rely on steel wool or metal sponges to remove accumulated films of dirt. Keep the utensils clean by scrubbing them vigorously with a brush and cleaner after each use.

Follow the washing operation with a rinse in plenty of clean hot water. Use hot water, as it does the work better and heats the utensils so they will dry more rapidly. All the wash water containing the dirt and cleaner must be rinsed completely from the utensils or the washing job will be ineffective.

## **How to Sanitize Milk Utensils**

After the utensils have been washed and rinsed, they must be sanitized, that is, treated to kill the bacteria on them, before they are used again. There are several methods for sanitizing milk utensils.

Consult your local milk-control official to find out which methods are approved for use in your milk market.

Certain chemicals may be used as sanitizers. Many chemicals are bactericidal, but only a few are suitable for use on milk utensils. The chemical most commonly used is some form of chlorine. Quaternary ammonium compounds and detergent-sanitizers are permitted in some localities.

Heat is the other main sanitizer. Any of the three forms of heat is an effective bactericidal agent when properly used. Steam is the most common, then probably hot water, and lastly hot air.

### **Sanitizing With Chemicals**

To be effective, the chemical sanitizer solution must be applied to the milk utensils at the proper strength and temperature and for the proper length of time. Consult your local milk-control official to find out the regulations governing the use of chemical sanitizers in your milk market.

Utensils should be immersed completely in the chemical solution whenever possible. The solution may be run over the surface of large pieces of equipment, such as permanently placed surface coolers, or they may be sprayed with a stronger solution.

There are two types of chlorine sanitizers—the hypochlorites and compounds containing organic chlorine. At one time each dairyman made his own stock solution of chlorine sanitizer. Now, however, the solutions are so generally available and keep so well they usually are purchased.

Either calcium hypochlorite or sodium hypochlorite is satisfactory for sanitizing milk utensils. Both are available in either liquid or powder form. To make a solution of the desired concentration, follow the manufacturer's directions, as

some hypochlorite products are more highly concentrated than others.

According to many health authorities the milk utensils must be exposed to a hypochlorite solution of approved strength at a temperature of at least 75° F. for at least 2 minutes. At lower temperatures, either the time of exposure or the strength of the solution must be increased. When the utensils are sprayed with a hypochlorite solution, double strength usually is required for the same time exposure.

One of the compounds containing organic chlorine—chloramine-T—has been used as a sanitizer for some time. It is more stable than the hypochlorites but its bactericidal action is considerably slower. Therefore, to obtain the same bactericidal action it must be applied to the utensils for a longer time than the hypochlorites and at a higher concentration.

Dimethyl hydantoin compound, a more recent development, combines the stability of chloramine-T and the faster action of the hypochlorites. It is somewhat acid in its reaction, and this increases its bactericidal effectiveness.

Quaternary ammonium compounds are another type of chemical sanitizer. They are more stable than most of the chlorine sanitizers and have the added advantage that their wetting power gives them more penetrability.

Their use is permitted in some localities but not in others. Consult your local milk-control officer before purchasing this type of sanitizer.

Utensils should be rinsed with pure water just before they are used if they were treated with quaternary ammonium compounds. Because of their stability, any film that remains on the utensils will still be active. Many health authorities feel that the cumulative effect of these films may have a toxic effect on humans.

Detergent-sanitizers, which are a relatively new development, are a combination of a detergent and either a quaternary ammonium compound or a chlorine compound. They are designed to combine washing and sanitizing in one operation.

Although some health authorities think very highly of detergent-sanitizers, others do not approve their use. When the chemical sanitizer comes in contact with milk or other organic matter on the milk utensils in the washing solution, its bactericidal effect is greatly reduced. Those who oppose the use of detergent-sanitizers think that their bactericidal effectiveness in the washing mixture is doubtful and, therefore, after the utensils are washed they must be rinsed and then treated to kill bacteria in the usual way.

### Sanitizing With Steam

Milk utensils may be effectively treated to kill bacteria by placing them in a tight cabinet and turning steam from a boiler into the cabinet

long enough to accomplish the desired result. A reliable dairy thermometer is essential. If the boiler is large enough, the temperature inside the cabinet may be raised to about that of boiling water in a few minutes.

If the steam is distributed evenly in the cabinet, and a reliable thermometer in the top of the cabinet shows that a temperature of 200° F. or higher has been maintained for 5 minutes or longer, it is certain that the number of bacteria on the utensils will be greatly reduced; slightly longer than 5 minutes gives a margin of safety. A temperature of 170° may be used if it is maintained for not less than 15 minutes.

Always place utensils such as cans, pails, and bottles in the cabinet open end down. If the utensils are placed open end up, it will take longer to heat them and the condensed steam cannot drain from them. Large steam cabinets usually are equipped with slatted shelves or racks, preferably made of rust-resistant angle iron or piping, on which to place the utensils.

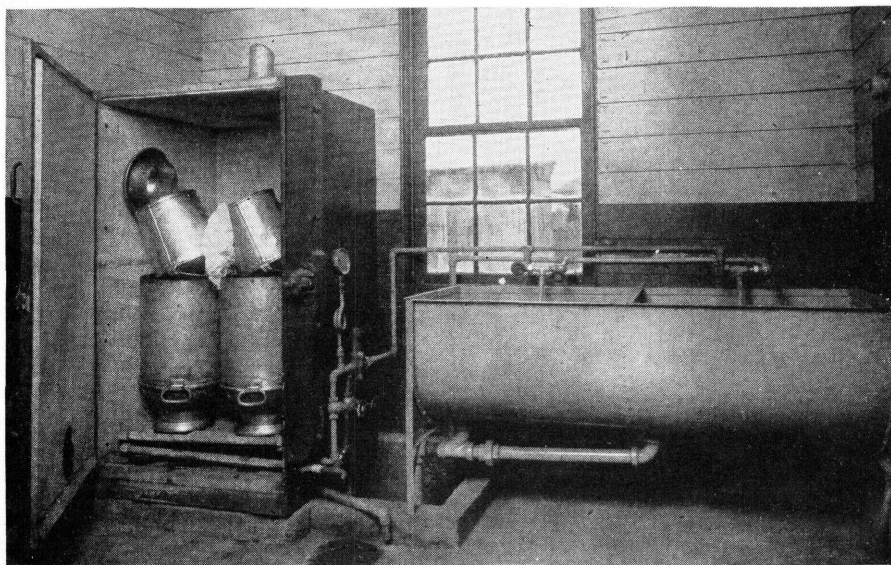


FIGURE 1.—A wooden steam cabinet, lined with galvanized sheet iron; and a galvanized-iron wash sink with washing and rinsing compartments.



This saves space and aids circulation of the steam.

Bottles may be treated in their cases but, if it is desirable to save space, they may be handled satisfactorily by placing them open end down on special removable shelves or racks with holes to fit the necks of the bottles.

As steam has a tendency to rise, it should be liberated underneath the utensils and, if possible, at the bottom of the cabinet. Also, it should enter the cabinet from several openings so it will be distributed evenly.

One satisfactory method is to admit the steam through a perforated pipe coil laid on the floor of the cabinet, as shown in figure 2. It will be noted in this instance that the steam passes through a long closed coil before it reaches the perforated coil. The closed coil may be used as a radiator to furnish heat for drying the utensils by closing the valve that admits steam to the perforated coil.

Another method is to construct shelves of piping connected with the

boiler, the center pipe in each shelf being perforated about every 12 inches. The utensils are inverted on these shelves.

### Construction of a Steam Cabinet

Steam cabinets may be made of any material that is not easily damaged by steam and that can be made into a tight box. Wood, galvanized iron, reinforced concrete, hollow tile, brick, and stone are some of the materials that may be used. If wood is used, two thicknesses of lumber put on at different angles will prevent warping better than a single thickness. However, one thickness of lumber with a watertight lining of galvanized iron makes a satisfactory cabinet.

Wooden cabinets made of two thicknesses of 1-inch lumber and galvanized-iron cabinets are practically equal in efficiency, and they are about  $2\frac{1}{2}$  times as efficient as concrete cabinets with uninsulated walls 4 to 5 inches thick. At least twice as much time is required to heat the uninsulated concrete cabinet, and more than twice as much heat. A boiler which is taxed to capacity to furnish enough steam for the uninsulated concrete cabinet is entirely adequate for a wooden or galvanized-iron cabinet more than twice as large; in other words, only half the boiler capacity is needed to operate a wooden or galvanized-iron cabinet as an uninsulated concrete cabinet the same size.

It is advisable to equip the cabinet with a safety valve set to open at a low pressure. The ordinary cabinet will withstand very little steam pressure. Although an increase in pressure will raise the temperature inside the cabinet, the resulting leakage of steam will more than offset the advantage of the higher temperature. Utensils properly steamed at a low pressure will be practically free of bacteria.

There should be a drain in the floor of the cabinet to carry off condensed moisture. The drain

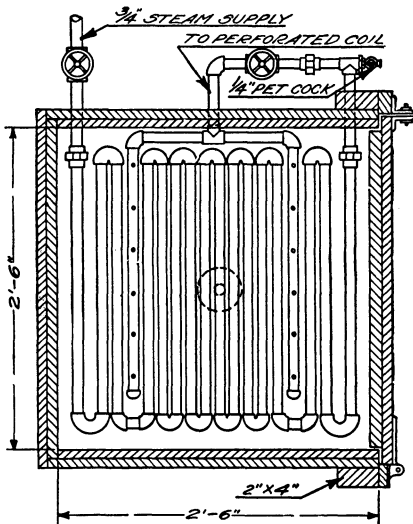


FIGURE 2.—Perforated and closed coils, which may be used on the floor of the steam cabinet to distribute the steam in the cabinet and then dry the utensils after they have been steamed.

should be water sealed, and this may be done by installing a U trap in the drainpipe. The lower part of the trap will remain full of water and prevent steam from escaping through the drain.

If drying coils are used after the utensils are steamed, there should be a damper in the top of the cabinet and one near the bottom. The upper damper should open into a galvanized-iron pipe which should be extended to carry the vapor outside the building. A good place for the lower damper is near the bottom of the door.

The cabinet should have a small hole in a protected place for a thermometer. Usually the best place is in the top of the cabinet or the upper part of the door.

The door should fit tightly to prevent the escape of steam.

### **How to Operate a Steam Cabinet**

Operating a steam cabinet is a simple matter. The time required for the temperature in the cabinet to reach a point high enough to kill the bacteria depends on several factors, including the type of construction and size of the cabinet, capacity of the boiler, the amount of steam pressure developed, the number and size of utensils, and the temperature of the surrounding air.

After the temperature of the cabinet has been 200° F. or higher for 5 minutes, the valve leading to the perforated coil may be closed. It may be found in practice that the temperature inside the cabinet will remain above 200° for several minutes after the steam is turned off.

If glass bottles are being treated, the steam should be turned into the cabinet slowly at first to prevent breakage. For the same reason, the cabinet should not be opened until the temperature has fallen.

It is important to dry the utensils thoroughly after they have been

steamed. Drying retards later bacterial growth and also prolongs the life of the utensils by preventing rust. Never wipe them dry; let them drain.

Drying coils in the cabinet are a distinct advantage in drying the utensils. When drying coils are in use, the dampers at the bottom and top of the cabinet should be opened so the moisture can escape as it evaporates from the utensils. The valve leading to the perforated coil should be shut, and the valve between the closed coil and the boiler should be open. The petcock on the closed coil (fig. 2) should be opened slightly to let the water formed by the condensed steam escape.

When the cabinet is hot enough to dry the utensils, the steam-supply valve should be closed and the petcock opened wide. A thermostatic trap, which will let the water from the condensed steam escape automatically, may be installed in place of the petcock.

If the utensils are not dried in the cabinet, as soon as they are cool enough to handle they should be removed from the cabinet and placed open end down to drain and dry on a rack in a clean place protected from all contamination.

### **The Box Steamer**

If a steam boiler is not available, the milk utensils may be treated to kill bacteria in a galvanized-iron box steamer. A box steamer is efficient, economical to operate, and simple to construct. Almost any tinsmith can make one at small cost. It should have a tight-fitting lid and there should be a small hole (preferably in the lid) in which to place a thermometer. The box may set on a concrete, brick, or stone foundation that serves as a firebox, or on a gas or oil stove, or some other heating device.

Use one-half to three-fourths of an inch of water in the box. Place

the utensils on a slatted rack an inch or so above the water. Put the lid on the box and heat the water until it boils. The steam generated will soon raise the temperature in the box to about that of boiling water. A temperature of 200° F. or higher should be maintained for at least 5 minutes. The procedure is exactly the same as for any other steam cabinet, except that the steam is generated within the box.

In experiments by the Department of Agriculture, 10-gallon cans that had been washed and rinsed were then steamed in a box like the one shown in figure 3. This treatment killed practically all the bacteria in the cans. Each can contained an average of approximately 80 million bacteria before steaming as compared with approximately 2 thousand after steaming.

This box may be used also to heat the water for washing the utensils. If most of the water is drawn off for washing, and if the

utensils are steamed immediately after they are washed, very little additional fuel will be needed for steaming. Leave enough water in the box so that it will not be dry when steaming is completed.

### Sanitizing With a Steam Jet

Sometimes a steam jet is used to sanitize milk utensils, but this method is not as satisfactory as the other methods described in this bulletin, because there is no way to determine if the temperature reached is high enough to kill the bacteria. If this method is used, it should be limited to pails, cans, and strainers.

The utensils should be inverted over the steam jet for at least 1 minute; they always should be steamed until they are too hot to handle with the bare hands. They will dry from their own heat if they are placed open end up and left uncovered for a few minutes before they are inverted on the storage rack.

Steam jets may be made easily by extending a pipe from the boiler half an inch or an inch up through the drainboard of the sink. A valve by which the steam may be turned off should be installed in the pipe directly beneath the drainboard.

### Sanitizing With Hot Water

Water must be very near the boiling point to be effective as a sanitizing agent. Hot water may be run over or through large pieces of equipment. Its temperature should be determined as it leaves the equipment. The water must be at least 170° F. as it leaves the equipment and must have been in contact with the equipment for not less than 15 minutes; or it must be at least 200° and have been in contact with the equipment for not less than 5 minutes.

When utensils are sanitized by immersion in hot water, the same

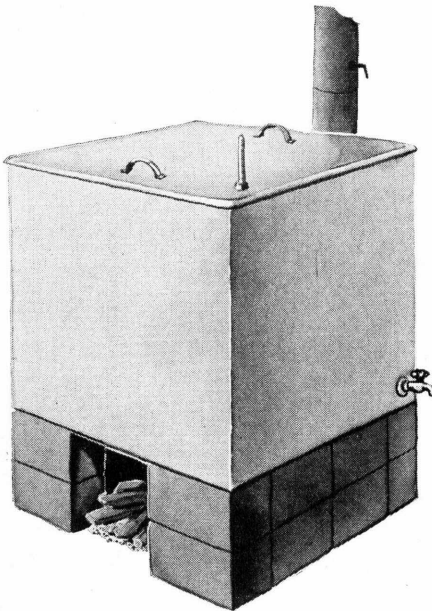


FIGURE 3.—Galvanized-iron box for use on small dairy farms to heat water and treat utensils to kill bacteria. A steam boiler is not required.

temperatures and times are required, and the water must be at the required temperature for the entire immersion period.

### **Sanitizing With Hot Air**

Milk utensils may be sanitized with hot air in a cabinet similar to a steam cabinet. Preferably, the cabinet should be made of metal. There should be a slatted platform or rack in the bottom of the cabinet.

Place the utensils on the rack so that circulation of the hot air is not restricted. Air circulation is particularly important in a hot-air cabinet. For effective bactericidal treatment, the temperature in the coldest part of the cabinet must be maintained at not less than 180° F. for not less than 20 minutes. Let the utensils remain in the cabinet until they have cooled off.

### **Storing the Clean Utensils**

After the utensils are washed and sanitized, they must be carefully stored until they are used again.

To protect the clean utensils properly, they must be stored in a clean, dust-free space where insects, rodents, or other animals cannot contaminate them. This space may be a special cabinet or, preferably, a clean, well-screened room with plenty of light and pure air. Permanently placed equipment must be covered to keep out dirt.

Cans, pails, strainers, and similar utensils should be stored on racks with the open end down so that any moisture remaining in them will drain and, at the same time, the utensils will be aired without dust or dirt falling into them. The storage racks should be made of rust-resistant angle iron or pipe. Metal racks are easier to keep clean than wooden racks, and usually they will last longer.

## **Washing and Sanitizing Milking Machines**

Special care must be exercised in cleaning milking machines. Immediately after use, rinse the entire machine with cool or lukewarm water until all trace of milk is removed. This may be done by placing the teat cups in a pail of water and drawing the water through the machine by vacuum. Next draw a pail full of hot washing solution through the units. If the rinsing is thorough, you may delay the washing operation, but the sooner it follows rinsing the easier it will be to get the machine clean.

To wash, dismantle the milking machine and scrub all parts thoroughly in the washing solution. Use special brushes designed to clean the separate parts. Special brushes are particularly important in cleaning milking machines because it is almost impossible to get the parts clean without the brushes that are made to fit the parts.

After washing, rinse all parts in hot water until all of the washing solution is removed. Invert the pails and heads on a rack where they will dry and be protected from dust and contamination. Hang the teat cups in a special rack made to keep them full of sanitizing solution. If such a rack is not available, immerse the rubber parts in a sanitizing solution or hang the cups and tubes in a clean and protected place until the next milking.

Units made especially to sanitize and store the rubber parts of milking machines are on the market. Any of these units may be used if they are approved by your local milk-control official.

After assembling the machine for the next milking, draw some sanitizing solution by vacuum through the whole machine. Be sure to empty the sanitizer out of the milk-pails before milking.

If you have the pipeline milking-machine system, rinse the whole system, including the pipeline, immediately after milking. Consult your local milk-control official to find out about local regulations for cleaning the pipeline after rinsing. In some localities, the line must be completely dismantled and scrubbed; in other localities, in-place cleaning is permitted.

Research and experience have shown that 2 sets of teat-cup liners used alternately, a week at a time, will last approximately as long as 3 sets if each set is used continuously until it is worn out. After a set has been used a week, scrub it thoroughly. Then give it a lye bath and store it in a cool dark place for a week while you use the other set.

The procedure for the lye bath is as follows: Place a wooden rack in the bottom of a pan, put all the rubber parts on the rack, and cover them with water. Add 4 teaspoonsful of lye for each quart of water, bring the lye-water to a boil, then remove the pan from the heat. When the water has cooled, remove the rubber parts from the pan, rinse them thoroughly, and store them in a clean dark place until they are to be used. Sanitize the parts just before they are used.

Boiling the rubber parts in a lye solution removes the milk fat from the pores of the rubber, restores its resiliency, and prolongs its life.

## **Washing and Sanitizing Bulk-holding Tanks**

If milk is cooled and stored in a bulk-holding tank on the farm, extra care must be taken to be sure the tank is clean and sanitary. One dirty milk can may spoil only 10 gallons of milk, but a dirty bulk-holding tank may ruin the day's milk from the whole herd.

You will reduce the cleaning work considerably if you rinse the tank as soon as it is emptied.

To wash the tank, use a hot solution of a good dairy cleaner of approved strength. Scrub the main part of the tank with a long-handled brush made for the purpose. Scrub all inner surfaces well, including the inside of the covers, and give special attention to all corners and joints. Scrub the agitator thoroughly. Scrub all connections, valves, pumps, and small openings with a suitable brush. Immediately after washing the tank, rinse it with plenty of hot water until all of the cleaner is removed.

Consult your local milk-control official and the manufacturer of your tank before deciding whether to sanitize with chemicals or with steam. Also, consult your local milk-control official to find out whether to sanitize the tank immediately after washing or just before the next milking.

Chemical sanitizing is the most popular method. Use a high-pressure sprayer to apply the chemical. A nozzle that "fogs" the interior of the tank with a fine mist is often used. Be sure the connections from the spray container to the nozzle are long enough so that all parts of the tank and the covers can be reached easily.

Keep the covers closed after the tank has been sanitized to protect the tank from contamination.

There are some complications in sanitizing farm bulk-holding tanks with steam. The cooling medium in some tanks is in a closed system and cannot be shut off from the tank. There is danger of ruining the cooling system if enough steam is used to raise the temperature high enough to sanitize these tanks. Where steam can be used safely, it usually is difficult to raise the temperature of the tank high enough for a long enough time to kill the bacteria. However, as with other equipment, steam is an effective sanitizer where it can be used properly.